THE TREATMENT OF THE APPENDIX STUMP AFTER APPENDECTOMY.*

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THE method of disposing of the stump of the appendix has often been said to be the only unsurgical feature in the operation for appendicitis. As a topic of discussion, this question almost invariably arises when two or more surgeons meet together, and I have been particularly impressed by the interest shown in this subject at various medical meetings and in the clinics that I have visited. Furthermore, this subject has formed the basis of several articles in the current medical literature, and as some of the writers' conclusions are at such variance with my ideas on the subject I determined to communicate with a large number of representative operators in this country, and to tabulate and analyze their replies. In accordance with this plan, and at the suggestion of Dr. George Ben Johnston, letters were sent to one hundred and twenty-five surgeons, including all the members of the American Surgical Association, and other well known operators, so as to obtain a general and impartial view of the subject. Each of these men was requested to answer the following list of questions:

1. Do you crush or ligate stump?
2. Do you divide with knife or cautery?
3. Do you use any chemical in disinfecting?
4. Do you bury the stump? (*a*) If so, how? (*b*) If not, why not?
5. Have you observed any difference in the intensity or character of pain between cases when the stump is buried or unburied?

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6. Have you seen any ill effects arise from unburied stumps, if so, what?

7. Have you observed any harmful effects of any character from burying the stump?

One hundred and five replies have been received and the analysis of these reports has proved most interesting.

The answers to the first three questions show the minor differences of technique practiced by different operators: Forty-eight both crush and ligate the stump; 29 ligate without crushing; 13 crush but do not ligate; 7 either crush or ligate; 4 neither crush nor ligate.

In answer to question 2, the appendix is divided by the cautery by only 11 operators. The remaining number use either the knife or scissors.

Many surgeons evidently believe in the attempt to disinfect the stump: Thirty-eight use carbolic acid; 15 use carbolic acid followed by alcohol; 10 use carbolic acid occasionally but not as a routine; 4 use the cautery; 10 use chemicals other than carbolic acid or the cautery; 28 do not attempt to disinfect the stump.

The chief interest in compiling these statistics, however, lies in the answer to question 4. The analysis of the 105 replies show that 77 *always* bury the stump, 66 by ligating and inverting into wall of cæcum, 11 by invaginating the unligated stump into the cæcum; 11 *usually* bury the stump (leave unburied only in drainage cases); 3 have no settled method; 2 leave no stump; 11 never bury the stump; 1 does not answer the question.

Thus it appears that the stump is always buried by 73.3 per cent. and usually buried by 10.5 per cent. of the representative surgeons in this country, while only 10.5 per cent. make a practice of never burying the stump.

Post-operative pain has been stated by different writers as a defect in the different methods of handling the stump. Of 103 replies to question 5, 78 have observed no difference whether the stump was or was not buried; 20 are unable to answer (personal observation on only one method); 3 state that pain is greater when stump is buried; 2 state that pain is greater when stump is left unburied.

In reply to question 6, 23 of the 105 reports make mention of untoward results that have followed simple ligation and leaving the stump unburied. The remaining answers state that they have not personally observed any ill effects, or else have had no occasion for observation because of the reason that they have never left the stump unburied. It seems worth while to mention in more detail these replies.

(1) Four cases of intestinal obstruction from adhesions of the bowel to the stump, two of which were fatal—Armstrong, Montreal.

(2) Many temporary fæcal fistulæ—Bevan, Chicago.

(3) One case of fatal peritonitis, one case of fæcal fistula—Blake, New York.

(4) Occasional fæcal fistula—Bryant, New York.

(5) Several cases with very bad adhesions, one case of persistent suppuration—Estes, South Bethlehem, Pa.

(6) One case slipped ligature—Gerster, New York. (Operation by a house surgeon.)

(7) One case adhesions on reopening abdomen—Gwathmey, Norfolk.

(8) One case stump leaked, abscess—Harris, Chicago.

(9) Occasional fæcal fistula—A. B. Johnson, New York.

(10) Post-operative adhesions common—H. A. Kelly, Baltimore.

(11) Two cases of ileus from adhesions—MacLaren, St. Paul.

(12) One case slipped ligature, peritonitis, death—Matas, New Orleans.

(13) Fæcal fistulæ common—Monks, Boston.

(14) One case of abscess, death—Munro, Boston.

(15) Three cases of intestinal obstruction from bands adherent to stump—Oliver, Cincinnati.

(16) Fæcal fistulæ, slow healing, oftener infection—Owen, Chicago.

(17) One case stump sloughed, death, autopsy—Rixford, San Francisco.

(18) Occasional fæcal fistula—Senn, Chicago.

(19) One case Fallopian tube found adherent to appendix stump—W. J. Taylor, Philadelphia.

(20) Persistent sinuses—Vander Veer, Albany.

(21) Fæcal fistulæ common—Watson, Boston.

(22) Fæcal fistulæ commonly result—Weir, New York.

(23) Fæcal fistulæ more common—Willard, Philadelphia.

In striking contradistinction to the many complications following the practice of leaving the stump unburied, I am very much impressed by the fact that in the replies to question 7, only 2 surgeons out of 105 state that they have ever observed harmful effects of any character after burying the stump. These are as follows:

(1) "In one case a stitch gave way during the first defecation (after calomel) and a large exudate developed with symptoms of perforation. The exudate, however, was absorbed and the patient recovered"—Gerster, New York.

(2) "Two secondary abscesses"—Mumford, Boston.

Intestinal hemorrhage following invagination of the unligated stump has been reported frequently in the current medical literature. Although no inquiry was made in my letter as to the incidence of hemorrhage, yet it is of interest to note that 10 of the 105 replies contain statements in regard to this point. Several of these operators say that they have seen hemorrhage in the practice of their colleagues; but in addition not a few interesting personal cases are cited, in several of which the abdomen had to be reopened because the patient was almost pulseless. Several deaths from hemorrhage are reported in this series.

Although comment is hardly necessary after merely tabulating these statistics, yet attention may be directed in a brief way to several points.

Post-operative pain is one of the arguments advanced by the exponents of the unburied stump. The brilliant researches of Lennander, however, on the absence in the visceral peritoneum of nerve fibres which convey the sense of pain, serve to thoroughly invalidate this assumption, and in full agreement with this is the clinical experience of the vast majority of operators.

Infection, and *abscess,* after burying the stump would seem from the analysis of these replies to be regarded in the light of a theoretical rather than practical objection to this method. It is to be noted that only 2 of the 105 operators, including the 11 who believe in leaving the stump unburied, report that they have observed any sequela of this character when the stump is buried, while no mention is made of any fatalities from this source.

Adhesions following burying the stump are not reported in a single reply, although in some of the articles by exponents of the unburied stump the liability of adhesions to the region of the buried stump is one of the objections to this procedure. That adhesions do occur when the stump is left unburied is only too apparent by the number of cases of intestinal obstruction reported in these statistics which were found to be due to adhesions of the unburied stump to the omentum, small intestine, or abdominal wall.

The chief objections to leaving the stump unburied appear in nearly one-fourth of the 105 replies. They are: (1) obstruction to the bowel; (2) slipped ligature, with escape of fecal contents into the abdominal cavity; (3) adhesions of the raw surface of the stump to omentum, abdominal wall, and various nearby viscera. Two personal experiences with the unburied appendix stump impressed me very forcibly with the defects in that method.

In the first case a myomectomy was done and a practically sound appendix was removed at the same time. As it was a perfectly clean operation, the appendix was ligated, amputated, and the stump allowed to fall back into the cavity. Two days after operation the woman developed post-operative distention of the bowel, the ligature was "blown off," with the escape of fecal contents into the abdominal cavity. Death occurred from general peritonitis, and the conditions as described were confirmed at the autopsy. This case, to my mind, illustrates one of the most dangerous accidents that are liable to occur in any patient in whom the stump is simply ligated and not buried. Distention of the bowel may occur after any abdominal operation and it is easy to understand how the increased pressure within the bowel will balloon out the appendix stump into a pyramidal-shaped body, with the apex at the ligature, and the integrity of the bowel wall is thus jeopardized in every case in which any distention ensues.

Shortly after the above case was operated upon, a patient was admitted to Dr. Johnston's service with evident intestinal obstruction. Operation showed an unburied appendix stump adherent to the abdominal wall, and a kinking of the small intestine about this adhesion so as to cause a partial obstruction of the gut. The patient recovered after separating the adhesions, freeing the loop of intestine, and burying the appendix stump in the cæcal wall.

We always make it a practice to ligate and bury the stump of the appendix whenever practicable, and in following our results during the past three years I have never seen any ill effects that would lead us to make any change in our method of procedure.

I am very much indebted to the surgeons who replied to my letter and for the evident interest that they have displayed in this matter by personal letters and other communications.